Impacts of health and economic costs on street children working as waste collectors in Dhaka City

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Abstract: This research investigates the health impacts and access to health services by children who are engaged in waste collection in Dhaka, the capital city of Bangladesh. The relevant qualitative data were collected through expert interviews and personal observations, while quantitative data were gathered through a face-to-face questionnaire survey given to 50 street children who

collected waste at the landfill site located in Dhaka City's Matuail area. The results indicate that 94% of these children have suffered from many health problems, such as fever and fatigue due to tiredness, dizziness, and vomiting. Consequently, a significant portion of their daily income is spent on medical treatment. This study suggests that the waste collection system must integrate modern technological, health and environmental resources so that: firstly, they do not harm waste collectors; and secondly, rehabilitate the street children and give them better access to acceptable basic amenities. This is a priority the city authorities.

Keywords: street children; landfill; waste collection; waste management; health services; health cost; Dhaka City.

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1 Introduction

It is now well established that street children constitute one of the most vulnerable and disadvantaged segments of the population throughout the developing world, and Bangladesh is no exception. Street children generally come from the families that are poor and socio-economically vulnerable. Families do not have a good level of earnings so that they can eat properly or have good meals consistently; as a result, the majority of street children suffer from malnutrition-related diseases (Islam et al., 2013). A large-scale International Labour Organization (ILO) sponsored survey undertaken in the Philippines in 1995 found that 60% of all economically active children were exposed to hazardous working conditions. Moreover, 19% were exposed to biological hazards, 26% were exposed to chemical hazards and 51% were exposed to environmental hazards (NSOP, 1998). Out of all child workers, 24% suffered work-related illness and/or injury, i.e., the prevalent rate was much higher than that for adult workers. The most common injuries were cuts, wounds, or skin punctures, and they accounted for 69% of the total injuries. Body aches and pains (59%) and skin diseases (22%) were the most common work-related illnesses.

While the majority child workers are prone to immediate health problems, they are also likely to develop numerous diseases that might only manifest in adulthood due to these early life exposures (Kassebaum et al., 2017). It has been previously documented that exposure to pesticides, chemicals, dusts, and carcinogenic agents in agriculture, mining and quarrying and manufacturing increases the risks of developing bronchial complaints, cancers and a wide variety of diseases (ILO, 1998; Fassa et al., 2000; Goel et al., 2012). In India, large numbers of child labourers who work in industries suffered from high rates of tuberculosis (TB) and silicosis; stonecutters and slate workers, for example, have silicosis rates of 35% and 55%, respectively (Ravindra et al., 2016). A report published by the ILO (1998) indicates that cancer risks have risen significantly through exposure to asbestos in mining and construction and to aniline dyes in carpet and garment manufacturing. An epidemiological study on child labour in Egypt reveals that children are at risk of developing chronic health problems directly associated with particular exposure. However, secondarily these exposures may also enhance some

biological events that decrease the latency period of some life-threatening diseases (Mohammed et al., 2014).

Landfill areas are closely linked to health issues. Hossain et al. (2016) contended that children working in landfills needed better medical facilities. Abdou et al. (2007) identified four main health problems, these being respiratory or allergic infections, eye infections, gastrointestinal tract (GIT) infection and musculo-skeletal injuries. These are conditions that accounted for 65.5%, 48.3%, 20.7% and 17.2%, respectively, of the landfill workers in Jeddah, Saudi Arabia.

Research specific to waste incinerators has provided mixed evidence on the effects of proximity to incinerators on health (Reeve et al., 2013). The study by Rushton (2003) claimed there was not much evidence that proximity to incinerators was associated with reproductive or developmental effects. Cancer incidence and mortality in populations around landfill sites or incarcerators were equivocal, and inconsistent findings were reported. Some geographical comparison studies investigated cancer mortality and incidence around waste sites (Wang et al., 2016; Edelstein, 2018). They did not find any differences in cancer incidence around the waste disposal area when compared with distant sites. In contrast, recent studies confirm that the increased frequency of different cancer types such as ovarian, gastrointestinal, oesophageal, stomach, colon and rectal cancer was related the areas around waste disposal zones and toxic release inventory sites (Choi et al., 2006; Roberts, 2017; Hanchette et al., 2018).

There is generally a high level of awareness in the health sector regarding the problems connected with harmful healthcare waste, and that is mostly due to the potential spread of HIV from poor waste dumping (Mukankomeje, 2010). Improper waste disposed on land or in water typically occurs in some developing countries and especially among less or poorly educated people. Toxic and infectious materials are dangerous to human health. These infectious materials can cause skin and blood infections, eye and respiratory infections as well as different diseases caused from vector-borne germs. Uninhibited burning of waste at dump sites releases fine particles into the air, which are the main reason for eye and respiratory illness. Mosquitoes grow in waste materials, which results in spreading disease and particularly malaria and dengue fever. Rats find safe haven and food in waste dumps. Rats consume and spoil food, spread disease, and inflict unpleasant bites (Sridevi et al., 2012). Poor hygiene practices of waste pickers contribute to their health vulnerabilities, especially carrying worm infestations and suffering respiratory and other infections (Singh and Chokhandre, 2015).

Infections in children can take place from direct contact with contaminated materials, dog and rodent bites, or eating of waste-fed animals. Wounds can lead to tetanus, hepatitis, and HIV infection. Injuries at dumps are caused by surface substances, underground fires and slides of land or materials. Headaches and nausea are very evident among children because of the anoxic conditions at the disposal sites where they work. These places have high methane, carbon dioxide, and carbon monoxide concentrations, and lead poisoning can wreak havoc among children when materials with lead-containing batteries, paints, and solders are being burnt (Cointreau, 2006). A review of the literature shows that socio-demographic differences of populations living near waste sites may also confound results. Finally, there are relationships between occupational external radiation exposure and cancer risks (Haylock et al., 2018).

According to Aweng and Fatt (2014), garbage collectors with a middle-income level have suffered the most from cough and fever because they were not able to visit a specialist for their health check-up. Neither did they have the opportunity to have good

nutrition for a better immune system since they earned money that was only sufficient to support their livelihood (Aweng and Fatt, 2014). Amegah and Jaakkola (2016) observed that TB, bronchitis, asthma, pneumonia, dysentery, parasites, and malnutrition were generally the most experienced diseases among waste pickers, and the report is based on the health studies of waste pickers conducted in Bangalore, Manohar, and New Delhi in India. Another study undertaken by the Direct Initiative for Social & Health Action (1996) was done on 180 waste pickers working at the Calcutta, India open dumps in 1995. During the course of one year, 40% of waste pickers had chronic cough, and 37% contracted jaundice. The average incidence of diarrhoea was 85%, fever was 72%, and coughs and colds were 63%. Eye soreness or redness occurred in 15% and skin ulcers in 29%, and the report relates that nearly all rates were higher at the largest dump site than the average.

Ray et al. (2004) conducted a study which assessed the respiratory and general health of rag pickers who rummage through the garbage dumps and landfill sites in India. They found respiratory symptoms and lung function decrement was recorded in 94% and 52% of the rag pickers, respectively, compared with 56% and 34% of the control samples. Using a mixed-methods approach, Schenck et al. (2019) explored the health risks to which waste pickers working on nine different landfills in South Africa were exposed. A socio-ecological framework served to analyse and present the results which indicate that waste picking, by its very nature, lends itself to innumerable health risks. However, in their systematic review of 379 papers from 1995–2014, Ncube et al. (2017) examined the health risks posed by municipal solid waste management activities, concluding that overall epidemiological evidence in reviewed articles is inadequate. This is mainly due to methodological limitations and future research needs to develop tools able to demonstrate causal or non-causal relationships between specific waste management operations and adverse health endpoints.

Fire in the dumping area is the cause of some respiratory diseases experienced by pickers, and the risk could be reduced by using proactive masks (Cowing, 2013). The findings of the study by Dias and Samson (2016) reveal that waste pickers strongly believe they contribute to the environment regarding public health issues by reducing pollution and maintaining city cleanliness. Another frequently mentioned contribution is related to employment. Saifullah and Islam (2016) observed that some child labourers worked in Dhaka and elsewhere in Bangladesh. Environmental awareness among the street pickers is necessary. The battery recycling industry in Dhaka employs some child labourers, and this has a lasting impact on their health.

Children are particularly vulnerable to toxins because they ingest more water, food, and air per unit of body weight; their metabolic pathways are less developed in the ability to detoxify and excrete toxins. In addition, any disruption during their growth years can easily disrupt development of their organs, nerves, immunity, endocrine, and reproductive systems (Posso, 2019). Castro and Hunting (2013) found that children suffered joint injuries due to lifting heavy waste-filled containers and respiratory illness from ingesting particulates, bio-aerosols, and volatile organics during waste collection, and from working in smoky and dusty conditions at open dumps. Added to this, the likelihood of child labourers suffering poor health in their adulthood is a very plausible factor. When a child works because of poverty, he or she lacks essential resources like food and basic healthcare; consequently, chronic under-nourishment in childhood will

affect a person's life trajectory and expected to have a long-run constructive impact on the individual's health practices (Guarcello, 2004).

Understanding the physical health background in the context of behaviour and other socio-economic features of the environment in which children live and work, is necessary for establishing the appropriate measures that policy-makers should make. Ultimately, the actions undertaken and based on comprehensive data can ensure children labourers' rights and strategies to eradicate poverty from society. The aim of this study is to understand the physical health impacts of street children who work as waste collectors in Dhaka, Bangladesh. Understanding these street children's health issues due to their exposure to various forms of waste in one of the most crowded cities in the world, will help to develop an effective policy globally for similar situations.

2 Methodology

This study employed two different methodologies: firstly, the quantitative study was done on the basis of a carefully designed semi-structured questionnaire; secondly, this was actually done following the qualitative study. The qualitative study comprised a survey that was conducted among two different types of respondents:

1 paediatricians (child specialists)

2 children living in the studied geographical location.

Some informal observation was also done to understand the different issues within the surveyed location and gauge the lifestyles of the waste collecting-children living in this location. Desk research was conducted to design the discussion guide for the qualitative survey, which includes searching for information online, relevant journal articles, monographs, book chapters, etc.

The interviews with experts in the current study involved two paediatricians, who have worked for more than five years at the study location. These interviews helped to generate ideas on the types of patients who visited the doctors, type of diseases, the reason for these diseases, and prevention of the diseases. Before finalising the questionnaire, a pilot survey on five in-depth interviews was conducted among the street children – the waste collectors staying within the study location which was the landfill located at Matuail, Dhaka. Finally, the data were collected through a questionnaire and the samples were selected based on convenient random sampling. Data were collected between September and November 2013. The final survey included data gathered from 50 children waste collectors at the landfill in Matuail, Dhaka. The inclusion criteria were: permanent and/or temporary waste collectors and working for at least 6 months or more. In total 74 street children who collect waste fulfilled the eligibility criteria and 50 participated in this study (response rate of 67%).

3 Findings and discussion

3.1 Demographic and economic profile of street waste collector children

The study conducted a survey among 50 respondents and of these, 40% were girls and 60% were boys. The age of respondents ranged from 8–15 years (Appendix 1). 98% of responders went to school while the other 2% did not. Among the 98% school-going children, 62% went to non-government organisation (NGO) schools and 36% attended government primary schools. Those who went to NGO schools were provided with food and education materials by the NGO. Children who responded said they started collecting waste at the age of six and had worked for 2.12 years. 40% of girls and 16.6% of boys collected food from waste items. 64% of responders lived in tin shed houses while 22% lived in a house made of bamboo and other materials; 14% responders lived in brick-built houses. Those who were tenants paid an average monthly rent of 2,213 Bangladesh Taka (Bangladesh currency).

The range of earnings for the girls was 40 to 119 Bangladesh Taka while for the boys it was 40 to 150 Bangladesh Taka. The overall average income of children was 78.70 Bangladesh Taka per day. Half of the responders live in a family with four members. Among the responders, 20 families had three members earning money and 17 families had four members earning a livelihood. The family's income made by waste collection varied from 70 to 800 Bangladesh Taka per day. From other sources, the income range varied from 500 to 550 Bangladesh Taka per day. For a family of 4.16 members, the average family income was 573.8 Bangladesh Taka. 16% of waste collector children lived below the poverty line (income of 1.25 USD per day on the margins of the poverty level). The majority of children lived in vulnerable situations because they saved nothing for emergency situations, and basically were unable to continue working or pay for immediate healthcare costs, etc.

3.2 Health problems and waste collection

Out of 50 responders, seven girls and 13 boys claimed their health was poor (Table 1). At the same time, eight girls and 11 boys felt they had very poor health compared to others; four girls and five boys felt fair compared to his /her peers; and one girl and one boy felt they were in excellent health compared to others.

Table 1 Respondents' present health condition

Gender	*Poor*	*Very poor*	*Fair*	*Excellent*
Girl	7 (14%)	8 (16%)	4 (8%)	1 (2%)
Boy	13 (26%)	11 (22%)	5 (10%)	1 (2%)
Grand total	20 (40%)	19 (38%)	9 (18%)	2 (4%)

The most important issue for the waste collector children was the risk to their health, something that 94% of the children agreed to. The average scale was 4.4 out of 5 for the health risk (Table 2). The average value of the scale was 4.50, and 88% children agreed that impacts on their health due to their work harmed what they did in the future. Waste was the main reason for chronic diseases, and this point of view was agreed to by 86% of responders, and the average value of the scale was 4.44. When the children were asked

how to get rid of a health risk, 70% answered that they had no idea; on the other hand, 22% stated they would look for hospital treatment.

Table 2 Respondents' perceptions of health impacts of waste collection

Assessment of personal ability	*Observation scale*					*Average value of scale*	*S.D.*	*Agreed (4 and 5) observations*	*Disagreed (1 and 2) observations*
	1	*2*	*3*	*4*	*5*				
Health risk is the main issue for children	0%	2%	4%	22%	72%	4.44	0.67	94%	2%
Health impact destroys a career in the future	0%	6%	6%	20%	68%	4.5	0.86	88%	6%
Waste is the main reason for chronic disease	0%	0%	14%	28%	58%	4.44	0.73	86%	0%
Children know how to protect their health from risk	28%	42%	8%	10%	12%	2.36	1.32	22%	70%

There were 36% children who had some bad habits, and this was opined by 50 respondent children (Table 3). Our findings also showed that 2% children smoked cigarettes, 8% took betel-leaf, and 6% took tobacco with betel-leaf. They had been doing this for more than one year. However, 84% children agreed that bad habits were more harmful than waste collecting. At the same time, 6% disagreed and 6% of children realised the impacts of bad habits on their working lives.

Table 3 Respondents' addiction in tobacco with betel-leaf

Gender	*No bad habits*	*Cigarettes*	*Betel-leaf*	*Tobacco with betel-leaf*
Girl	16 (32%)	1 (2%)	2 (4%)	1 (2%)
Boy	23 (46%)	10 (20%)	2 (4%)	2 (4%)
Grand total	32 (64%)	11 (22%)	4 (8%)	3 (6%)

3.3 Types of health problems suffered by street waste collector children

3.3.1 General health problems

Waste collecting children faced various health problems, like fever, fatigue or exertion intolerance due to tiredness, dizziness, and vomiting, etc. Based on the records for the last six months, 64% of respondents suffered from fever whereas 54% of cases were chronic in nature. Their average days of suffering numbered 43.59; 31.25% of children received treatment (Appendix 2). 68% children felt tired due to their exertions and of these, 60% were chronically tired. Their average days during which they suffered health problems was 25.88; average treatment was received by 17.65%. 86% of children were victims of dizziness and among 64% of them this was chronic. Their average days of suffering numbered 22.59 and average treatment was received by 9.30%.

3.3.2 Growth and developmental problems

Out of all 50 children, 64% suffered from growth retardation and 18% of them received treatment. 68% of all 50 children suffered from developmental/mental retardation, and 23.53% (34 children) received treatment.

3.3.3 Musculo-skeletal problems

Sometimes, waste collecting children were affected by musculo-skeletal problems, such as arthritis (joint pain) and back pain. Results show that 14% of children were affected by joint pain and it was chronic among 12% of them. Their average days of suffering numbered 17.43; average treatment was received by 85.71% (Appendix 2). 30% of the children suffered from back pain and 20% were chronic patients. Their average days of suffering were 15.26, and 73.33% children received treatment. 2% of the children had bone fractures and their average suffering days numbered 90. In fact, all 100% of the children received treatment.

3.3.4 Dermatological manifestation (skin problems)

Street children are affected by many types of dermatological manifestations (skin problems). In the case of skin health impact on the street children, the survey results show that 12% children suffered from a skin rash problem and this was chronic among 6% of them. Among these affected children, their average days of suffering numbered 28.33 days; the average treatment was received by 66.66% of children (Appendix 2). For the 2% children who were chronically affected by rash and irritation problems, their average days of suffering were 15; average treatment was received by 16.66%. Among the 52% children who endured a scabies problem, 36% were chronic sufferers. Their average days of suffering numbered 24.57 days and average treatment was received by 23.07% of children. 50% of the children suffered from cut injuries, and their average days of suffering were 13.32. Average treatment was received by 96% children, and for 6% of the children who were affected by bruises, their average days of suffering were 20. Treatment was received by 100% of affected children.

3.3.5 Respiratory problems

The results show that among the respiratory problems, there were coughs and haemoptysis (coughing with blood) or dyspnoea (shortness of breath). According to the survey results, 68% of children suffered with a cough problem. Among 60% of chronic sufferers of this group, their average days of suffering were 17.29; average treatment was received by 82.35%. Furthermore, 2% of the children suffered from coughing with blood; their average day of suffering was 20 days, and average treatment was received by 100%. Out of the children who suffered from shortness of breath, 14% children were chronic sufferers.

3.3.6 GIT problems

According to the survey results, 36% of children were affected by a GIT problem. Among the 30% of chronic sufferers, their average days of suffer were 16.05 days; average treatment was received by 94.44% (Appendix 2). Out of the 10% children who

suffered diarrhoea, 8% of children were chronic sufferers. Their average days of suffer numbered 32 and average treatment was received by 80%. Children sometimes vomited because they worked in unhealthy environments. 30% children were affected by vomiting and of these, 24% were chronic sufferers. On average their days of suffering were 30.26, and average treatment was received by 13.33%.

3.3.7 Vision and dental problems

The survey results show that 6% of children were affected by eye vision problems; among them, 2% were chronic sufferers, and the average days of suffering were 18.33; on average treatment was received by 66.66% (Appendix 2). 16% of the children were affected by dental problems and it emerged that 8% were chronic sufferers, and their average days of suffering were 14.5 days.

3.3.8 Wild animal hazards

Mosquitoes, flies, and various insects lived and bred in the landfill area. Moreover, children were affected on several occasions by parasites and head lice. Added to this, children were affected by stray animals like dogs, and their average days of suffering were 19.75 days; average treatment was received by 100% (Appendix 2). As the survey results show, 4% of children were affected by the parasites, and average treatment was received by 100% of children. 2% of children were affected by head lice problem and they were chronic sufferers. Their average days of suffering were 40 days, and average treatment was received by 100%. Meanwhile 8% of children were affected by mice/rats; their average days of suffering amounted to 4.75 days, and average treatment was received by 8%.

3.4 Currently available health service facilities

30% of the children agreed that they received help from health facilities (Table 4). However, 64% opined that they did not get any assistance from such facilities. The average scale was 2.46. 2% of the children agreed that health services were not expensive but 94% agreed that it was expensive, and an average scale was 4.52.

Table 4 Respondents' access to health facilities

Assessment of personal ability	*Observation scale*					*Average value of scale*	*S.D.*	*Agreed (4 and 5) observations*	*Disagreed (1 and 2) observations*
	1	*2*	*3*	*4*	*5*				
Street children going to health facilities	34%	30%	6%	16%	14%	2.46	1.46	30%	64%
Medical service is too expensive	0%	2%	4%	34%	60%	4.52	0.68	94%	2%

66% of children believed they could not consult a doctor because they could not afford to. Out of those children, 30% were girls and 36% were boys. 34% of the children thought that poverty was the main cause, which discouraged them from getting health treatment; out of them, 10% were girls and 24% were boys.

Children who collected waste could get health treatment in various ways, and data in Table 5 show that among the respondents, four girls and two boys did not receive any health service from anybody. Among the 30 respondents, 11 girls and 19 boys were able to get health services from the NGOs, pharmacy, community hospital, health centre and government hospital. Among the 14 respondents, five girls and nine boys received health services from various organisations.

Table 5 Respondents' sources of receiving health treatment

Health service	*Gender*		*Total*
	Girl	*Boy*	
No service	4 (8%)	2 (4%)	6 (12%)
Single service			
NGO	1 (2%)	2 (4%)	3 (6%)
Pharmacy	7 (14%)	13 (26%)	20 (40%)
Community hospital	1 (2%)	0 (0%)	1 (2%)
Health centre	1 (2%)	1 (2%)	2 (4%)
Government hospital	1 (2%)	0 (0%)	1 (2%)
Free medical camp	0 (0%)	1 (2%)	1 (2%)
Private hospital	0 (0%)	2 (4%)	2 (4%)
Total	11 (22%)	19 (38%)	30 (60%)
Multiple service			
Government hospital, pharmacy	2 (4%)	3 (6%)	5 (10%)
Free camp, pharmacy	2 (4%)	1 (2%)	3 (6%)
NGO, pharmacy	1 (2%)	2 (4%)	3 (6%)
NGO, private hospital	0 (0%)	1 (2%)	1 (2%)
NGO, health officers	0 (0%)	2 (4%)	2 (4%)
Total	5 (10%)	9 (18%)	14 (28%)
Grand total	20 (40%)	30 (60%)	50 (100%)

In every case, waste collecting children received few medicines or medical services. Consequently, these children experienced general health problems, like fever, fatigue or exertion intolerance due to tiredness, dizziness, and vomiting, etc. Only 34.38% received a free healthcare service, and 15.62% received free medicine (Appendix 3). For fatigue or exertion intolerance due to problems connected with tiredness, 17.65% got free physician advice, and 8.82% received free medicine. None received free medicine for dizziness but 6.98% could consult a doctor. For the problem of vomiting, they received no medicine or doctor service. For the growth retardation problem, 15.62% of children received free physician service, and 9.37% could obtain free medicine. For the developmental/mental retardation problem, 20.59% of children were treated free by a doctor, and 8.82% received free medical service. For pain of the joints, 14.28% of children received free physician service but none managed to get free medicine. For back pain problems, 53.33% of children received free doctor service, and 20% received medicine. For bone fractures, no child received any free surgery or medicine. For the skin rash problem,

33.33% and 16.66% of children received free general practitioner and medicine, respectively.

All of children who were affected by dermatitis (hot and irritated skin) consulted a physician. For the scabies problem, 53.85% could consult a doctor and 15.38% received a free medicine service. None received any free treatment for bruises. Regarding cough-related problems, 26.47% and 32.35% received free doctor and medicine, respectively. For coughing with blood and shortness of breath, no free medicine service was served. 22.22% of children could consult a doctor if they had abdominal pain. There was no free health service for diarrhoea. For eye vision-related problems, 33.33% of children received free assistance from a doctor, but they did not receive any free medicine. For dental problems, there was no free healthcare service. 100% of children were affected by stray animal attacks, and all of them received a free medical service. If they had been attacked by mice/rats, 25% of the children could consult a doctor, but they did not get any free medicine.

3.5 Economic cost of health problems of street waste collector children

3.5.1 General health problems

For general health problems, like fever, fatigue or exertion intolerance due to tiredness, dizziness, and vomiting, etc., the average expenditure was 51.71 Bangladesh Taka, and the opportunity cost was 305.94 Bangladesh Taka (Appendix 3). For fatigue or exertion intolerance due to tiredness, the average expenditure per child was 24.26 Bangladesh Taka, and the opportunity cost was 177.50 Bangladesh Taka per child. For dizziness, 23.12 Bangladesh Taka was the average expenditure, and opportunity cost was 99.65 Bangladesh Taka.

3.5.2 Growth and developmental problems

For the growth retardation problem, the average expenditure was 33.75 Bangladesh Taka, and due to absence from work, 227.65 Bangladesh Taka could not be earned by them (Appendix 3). For the developmental/mental retardation problem, the average medical cost for a child was 36.58 Bangladesh Taka, and the opportunity cost was 218.23 Bangladesh Taka.

3.5.3 Musculo-skeletal problems

For pain of the joints, the average medical cost was 161.86 Bangladesh Taka, and opportunity cost was 1128.57 Bangladesh Taka (Appendix 3). For back pain problems, the average medical expense for a child was 59.33 Bangladesh Taka, and the opportunity cost was 582 Bangladesh Taka. For bone fracture-related problems, the average medical cost was 15,000 Bangladesh Taka, and opportunity cost was 26,000 Bangladesh Taka.

3.5.4 Dermatological manifestation (skin problems)

For skin rash-related issues, the opportunity cost was 586.66 Bangladesh Taka, and the average medical cost of treatment amounted to 116.66 Bangladesh Taka (Appendix 3). For dermatitis (hot and irritated skin), the average medical cost was 40 Bangladesh Taka. For absence from work, the average of 300 Bangladesh Taka could not be earned. For the

scabies problem, 133.46 Bangladesh Taka was spent by any child as the average, and the opportunity cost was 560 Bangladesh Taka. For cut-related injuries, on average 161.31 Bangladesh Taka was spent, and the opportunity cost was 826 Bangladesh Taka. For bruises, 163.33 Bangladesh Taka was the average expenditure and the opportunity cost was 656.66 Bangladesh Taka.

3.5.5 Respiratory problems

Regarding coughing-related problems, there was highest average medical cost, and this was 140.73 Bangladesh Taka, and the average opportunity cost was more, i.e., 653.08 Bangladesh Taka. For coughing with blood and shortness of breath, 200 Bangladesh Taka and 1500 Bangladesh Taka were spent, respectively. For absence from work, 204.44 Bangladesh Taka could not be earned when the children endured coughing accompanied by blood, and 900 Bangladesh Taka could not be earned when children experienced shortness of breath (Appendix 3).

3.5.6 GTI problems

The average expenditure for abdominal pain was 153.88 Bangladesh Taka, and the average opportunity cost was 669.44 Bangladesh Taka (Appendix 3). For diarrhoea, a child spent 370 Bangladesh Taka as the average, and for absence from work, it was not possible to earn 1,360.00 Bangladesh Taka. With reference to vomiting, 34.60 Bangladesh Taka was the average expenditure, and the opportunity cost was 45 Bangladesh Taka.

3.5.7 Ocular manifestations (eye vision) and dental problems

For eye vision-related problems, the average expenditure was 160 Bangladesh Taka, and the opportunity cost was 176.66 Bangladesh Taka (Appendix 3). For dental problems, an average expenditure was 186.25 Bangladesh Taka, and 643.75 Bangladesh Taka could not be earned by the children when they were absent from their work.

3.5.8 Wild animal hazards

When having been attacked by stray animals, the average medical service cost was 225 Bangladesh Taka, and the work absence opportunity cost was 1,787.50 Bangladesh Taka, on an average (Appendix 3). Problems caused by mice/rats could mean that the average expenditure was 37.50 Bangladesh Taka. The opportunity cost of this was 100 Bangladesh Taka.

3.6 Expected health services and supports

If waste collection is based on more technology being used, this will reduce health expenditure and 92% of the children agreed with this (Table 6). The average scale was 4.52. The researcher wanted to know from the children whether they were conscious about free health services; 48% stated they did not know or disagreed. 36% of children said that they were aware or agreed, and the average scale measurement was 1.48.88% of the children agreeing that they needed the assistance of health services and the average

scale was 4.54. Current health and medical services must be improving; this point was agreed on by 90% of the children, and the average scale was 4.36.

Table 6 Respondents' expectation of health facilities

Assessment of personal ability	*Observation scale*					*Average value of scale*	*S.D.*	*Agreed (4 and 5) observations*	*Disagreed (1 and 2) observations*
	1	*2*	*3*	*4*	*5*				
Medical expenses will be reduced if waste collection is technology-based	0%	2%	6%	30%	62%	4.52	0.71	92%	2%
Are you aware of health facilities, like free medical service	24%	24%	16%	16%	20%	2.84	1.48	36%	48%
You need health assistance	0%	0%	12%	22%	66%	4.54	0.71	88%	0%
Current health and medical services need to be improved	0%	2%	8%	44%	46%	4.36	0.72	90%	2%

The children waste collectors were asked about what their health service expectations; 78% of them stressed the necessity of free medicine; gender-wise, 46% boys and 32% girls believed this. 62% of the children wanted free medical services, of which, 32% were boys and 30% were girls. 30% of these young waste collectors expected a free medical camp for their treatment, i.e., 14% were girls and 16% were boys. 20% of the children expected to have access to a mobile medical healthcare service, and 16% of the children expected to have the facility of emergency or fast track booth service.

Table 7 Respondents' expectation of health service

Gender	*Free medicine*	*Free medical camp*	*First track booth*	*Mobile medical*	*Free medical service*
Girl	16(32%)	7(14%)	3(6%)	4(8%)	15(30%)
Boy	23(46%)	8(16%)	5(10%)	6(12%)	16(32%)
Grand total	39(78%)	15(30%)	8(16%)	10(20%)	31(62%)

4 Conclusions

Waste collection is a risky profession and especially for street children. At least 50% of child waste collectors suffer from injuries, which are generally caused by the conditions of the workplace and medical complications. Due to the nature of the materials that exist in landfills, such as contamination and sharp metal edges, over 50% of waste collectors suffer from scabies and other skin problems. Results confirm that most respondents wanted free medicine, followed by free medical services. They want a healthy life and they dream of much better job options, but there is simply no alternative option. Many of

them are engaged in hazardous work, which is harmful to their long-term mental and physical development. Most of the waste pickers suffer from dizziness, followed by fatigue or exertion intolerance caused by tiredness and fever, malnutrition problems, growth retardation, and mental retardation. Moreover, there an increasing number of them are suffering from skin problems; respiratory problems constitute another major concern with significant numbers suffering from chronic coughing. There are cases of GIT problems and eye vision issues. Feeling physical pain on a daily basis is also a common phenomenon for child waste collectors. Most of them report as being affected by arthritis (joint pain), and especially back pain.

The economic cost of health problems that waste collector children have to live with, was estimated by calculating average expenditure and opportunity cost. For general health problems, like fever, fatigue or exertion intolerance, etc., the average expenditure was 51.71 Bangladesh Taka, and the opportunity cost was 305.94 Bangladesh Taka. The highest cost was calculated for bone fractures, the average medical cost being 15,000 Bangladesh Taka, and opportunity cost being 26,000 Bangladesh Taka. One of the most prevalent and frequent health problems to emerge concerned respiratory problems. Coughs resulted in the highest average medical cost (140.73 Bangladesh Taka), and the average opportunity cost was more than all other costs, i.e., 653.08 Bangladesh Taka. In trying to recover from coughing with blood and shortness of breath, 200 Bangladesh Taka and 1500 Bangladesh Taka were spent, respectively.

To improve the health of these children waste collectors, the following recommendations are made and must be implemented urgently. The Directorate-General of Health (DG-Health) which operates under the auspices of the Ministry of Health should establish a community health clinic near major waste centres such as Matuail. It should provide the essential facilities and free heath check-ups should be made available for all children waste collectors. It may be possible to make this affordable by the local authorities working with NGO initiatives to provide what is necessary. The government should make it a priority to request foreign donor support for the introduction of free basic medical facilities for the children. More importantly, the government should establish a minimum age for children entering this hazardous type of work or eliminate it completely by offering alternative work that is safe, according to the ILO guidelines. Donor agencies should be approached and asked if they can help develop an effective strategy for getting the children of Dhaka off the streets and into a much more secure charity that can look after them. Finally, the private sector and particularly the pharmaceutical/healthcare/medical companies should be requested to provide medical and other technical support for this initiative.

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Appendix 1

Table A1 Demographic and economic profile of waste collector children

Particular	*Total/average*
Gender	
Girl	20 (40%)
Boy	30 (60%)
Total	50 (100%)
Respondent age	
8–10 years	10 (20%)
11–12 years	11 (22%)
13–15 years	29 (58%)
Schooling	
Government	18 (36%)
NGO	31 (62%)
No schooling	1 (2%)
Involvement in waste collection	
1–2 Years	34 (64%)
3–4 Years	15 (30%)
5 Years	1 (2%)
Average	2.12
Age of starting waste collection	
6–8	7 (14%)
9–11	22 (44%)
12–14	21 (42%)
Average	10.54
Food collection from waste	
Girl	8 (16%)
Boy	5 (10%)
No collector	37 (74%)
House	
Brick	7 (14%)
Tin shed	32 (64%)
Mixed	11 (22%)
House rent	
1100–1500 Bangladesh Taka	8 (16%)
1600–2500 Bangladesh Taka	30 (60%)
2600–3500 Bangladesh Taka	12 (24%)
Average	2.213

Table A1 Demographic and economic profile of waste collector children (continued)

Particular	*Total/average*
Household's earning members	
2 members	13 (26%)
3 members	20 (40%)
4 members	17 (34%)
Average	3.08
Household's economic status	
A child's average daily income from waste	78.7
A household's average daily income from waste	437.8
A household's average daily income from others	138
A household's total income average	573.8
Per person daily income in a house	137.95
A household's below poverty line	16%
A household's average saving	2,870
A household's average borrowing	1,696

Appendix 2

Table A2 Health problems of children waste collectors

Disease	*Total affected children*	*Affected several times or chronic*	*Affected children's average days of suffering*	*Treatment received by affected children*
Common health problems				
Fever	32 (64%)	27 (54%)	43.59	31.25%
Fatigue/ exertion intolerance due to tiredness	34 (68%)	30 (60%)	25.88	17.65%
Dizziness	43 (86%)	32 (64%)	22.59	9.30%
Growth and developmental problems				
Growth retardation	32 (64%)	0	0	28.12%
Developmental/mental retardation	34 (68%)	0	0	23.53%
Musculo-skeletal problems				
Arthritis (joint pain)	7 (14%)	6 (12%)	17.43	85.71%
Back pain	15 (30%)	10 (20%)	15.26	73.33%
Bone fracture	1 (2%)	0	90	100%

Table A2 Health problems of children waste collectors (continued)

Disease	*Total affected children*	*Affected several times or chronic*	*Affected children's average days of suffering*	*Treatment received by affected children*
Dermatological manifestations				
Skin rash	6 (12%)	3 (6%)	28.33	66.66%
Dermatitis (hot and irritated skin)	1 (2%)	1 (2%)	15	16.66%
Scabies	26 (52%)	18 (36%)	24.57	23.07%
Injuries from cuts	25 (50%)	0	13.32	96%
Bruise	3 (6%)	0	20	100%
Respiratory problems				
Cough	34 (68%)	30 (60%)	17.29	82.35%
Haemoptysis (coughing with blood)	1 (2%)	0	20	100%
Dyspnoea (shortness of breath)	9 (18%)	7 (14%)	25.55	77.77%
GTI problems				
Abdominal pain	18 (36%)	15 (30%)	16.05	94.44%
Diarrhoea	5 (10%)	4 (8%)	32	80%
Vomiting	15 (30%)	12 (24%)	30.26	13.33%
Ocular manifestations and dental problems				
Eye vision problems	3 (6%)	1 (2%)	18.33	66.66%
Dental problems	8 (16%)	4 (8%)	14.5	100%
Animals and others				
Stray animals	4 (8%)	0	19.75	100%
Parasites (i.e., worms)	2 (4%)	0	0	100%
Head lice	1 (2%)	1 (2%)	40	100%
Mice/rats	4 (8%)	0	4.75	8%

Appendix 3

Table A3 Estimated cost of health problems of waste collector children

Disease	*Received free doctor service*	*Received free medicine*	*Average expenditures (BDT) by affected children*	*Opportunity cost (BDT) of affected children*
Common health problems				
Fever	34.38%	15.62%	51.71	305.94
Fatigue or exertion intolerance due to tiredness	17.65%	8.82%	24.26	177.5
Dizziness	6.98%	0	23.12	99.65
Growth and developmental problems				
Growth retardation	15.62%	9.37%	33.75	227.65
Developmental/mental retardation	20.59%	8.82%	36.58	218.23
Musculo-skeletal problems				
Arthritis (joint pain)	14.28%	0	161.86	1,128.57
Back pain	53.33%	20%	59.33	582
Bone fracture	0	0	15,000	26,000
Dermatological manifestations				
Skin rash	33.33%	16.66%	116.66	586.66
Dermatitis (hot and irritated skin)	100%	0	40	300
Scabies	53.85%	15.38%	133.46	560
Injuries from cuts	32%	0	131.6	826
Bruise	0	0	163.33	656.66
Respiratory problems				
Cough	26.47%	32.35%	140.73	653.08
Haemoptysis (coughing with blood)	0	0	200	1,500
Dyspnoea (shortness of breath)	0	0	204.44	900
GTI problems				
Abdominal pain	22.22%	0	153.88	669.44
Diarrhoea	0	0	370	1,360
Vomiting	0	0	34.60	45

Notes: *The imputed value is calculated as the average (number of days away from the job due to suffering and not able to earn a daily income) throughout the six-month period.

Table A3 Estimated cost of health problems of waste collector children

Disease	*Received free doctor service*	*Received free medicine*	*Average expenditures (BDT) by affected children*	*Opportunity cost (BDT) of affected children*
Ocular manifestations and dental problems				
Eye vision problems	33.33%	0	160	176.66
Dental problems	0	0	186.25	643.75
Animals and others				
Stray animals	100%	100%	225	1,787.50
Parasites (i.e., worms)	0	0	25	25
Head lice	0	0	40	40
Mice/rats	25%	0	37.50	100

Notes: *The imputed value is calculated as the average (number of days away from the job due to suffering and not able to earn a daily income) throughout the six-month period.